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ABSTRACT

A multiple choice Metaphor Preferences Test was administered to 138 preschool through college subjects to determine the role of a metaphor's ground in determining a metaphor's appeal, and to document the evolution of preferences for different types of grounds. Ground is the common property that links the two terms of a metaphor (topic and vehicle). The development of subjects' preferences for single metaphorical grounds was marked by a shift from static perceptual grounds (shape and color) to more dynamic perceptual grounds (sound and movement). Nonperceptual, conceptual grounds occurred, but were late in their development. An increased concurrence was evident between the ability to explicate particular grounds and the preferences for these grounds. Although preference for literal completions declined with age, an unexpected and differently motivated increase in literal selections in grades eight and ten occurred. (Author/RL)

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H A R V A R D P R O J E C T Z E R O

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Technical Report No. 14

AUTUMN LEAVES AND OLD PHOTOGRAPHS:

A DEVELOPMENTAL STUDY OF METAPHOR PREFERENCES

by

Lisa R. Silberstein, Ellen Winner, and Howard Gardner

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Autumn Leaves and Old Photographs: A Developmental Study of Metaphor Preferences

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Harvard Project Zero

Introduction

Recognizing resemblances among diverse aspects of experience is a pervasive aspect of cognition. The perception of a scene or the experience of an event frequently reminds one of another experience. Watching leaves falling from the trees in autumn, an observer may be reminded simply of last year's autumn leaves. But the scene may also evoke thoughts of things in many ways dissimilar from falling leaves. Because of the color of the leaves, the observer may think of glowing sunsets. The sound of the falling leaves may remind the person of shuffling feet. Or perhaps the sense of time passing, as a season ends, suggests a likeness between falling leaves and old photographs.

When today's autumn leaves evoke those of yesterday, only a literal similarity has been noted; but when these same leaves evoke sunsets, shuffling feet, or old photographs, a nonliteral similarity has been recognized (cf., Ortony, Reynolds, and Arter, 1978). Such nonliteral similarities underlie metaphorical thought; and expressed linguistically, any one of these nonliteral resemblances constitutes a metaphor (e.g., Falling autumn leaves are glowing sunsets).

Metaphorical similarity lies midway along a continuum ranging from literal similarity (e.g., this year's autumn is like last year's) to relationships which contain no clear similarity (e.g., autumn leaves are like chairs). While the boundaries separating metaphorical similarity from literal similarity on the one hand, and from anomalous links, on the other hand, are difficult to determine with precision, prototypical cases of each of the three types are not difficult to identify.

While extensive theoretical work has been carried out to determine the criteria necessary to distinguish metaphor from other types of similarity (Goodman, 1968; Ortony, Reynolds, and Arter, 1978), almost no theoretical or empirical work has focused on the criteria distinguishing one metaphor from another. Given a particular topic, an infinite number of comparisons can be generated, all of which lie within the metaphorical portion of the similarity continuum (e.g., Falling autumn leaves are pouring raindrops, or tossed confetti, or dropping parachutes, etc.). Clearly, while a series of metaphors may refer to the same topic, they vary enormously in their aesthetic quality and appeal. Yet most psychological investigations of metaphor have explicitly eschewed considerations of value or aesthetic merit.

One previous study has addressed the question of what makes a metaphor "good." After examining ratings of metaphors, Tourangeau and Sternberg (1978) argued that the aptness of a metaphor correlates with two elements: of primary importances is the degree to which the two terms hold relatively similar positions, with respect to the dimension they share, within their respective domains; and of secondary importance is the distance between the two domains.

Although Tourangeau and Sternberg have isolated two potentially important factors influencing the appeal of a metaphor, the very factor which such a taxonomy holds constant--the dimension which the two terms (topic and vehicle) of the metaphor share--may itself be a critical factor. The common property linking the two terms constitutes the ground of the metaphor. Grounds can range from static, perceptual properties such as shape or color (e.g., Falling autumn leaves are glowing sunsets) to dynamic properties such as movement or sound (e.g., Falling autumn leaves are shuffling feet) to conceptual, nonperceptual features (e.g., Falling autumn leaves are old photographs).

There are several possible roles that the ground may play in determining metaphor preferences. At one extreme, the ground of a metaphor may prove irrelevant to its appeal. Or, the preferred ground may depend on the specific topic and its salient characteristics (e.g., the feature commonly deemed most salient of snowflakes is color). Alternatively, perhaps aesthetic preferences for metaphorical grounds differ across individuals. Finally, a hierarchy of ground preferences may exist, with certain grounds experienced as more appealing than others across a range of topics, reflecting a strong influence of ground on the relative appeal of a metaphor.

The issue of the role of ground in metaphor preferences becomes more complicated, and consequently more interesting, when a second question is raised: Do children like the same kinds of metaphors as adults? In recent years, developmental psychologists have been conducting extensive research examining children's metaphorical abilities. Yet their aim, like those studying metaphor in adults, has only rarely been to explore the principles guiding children's preferences in metaphor. One such study has ascertained that children become increasingly consistent with age in selecting their favorite metaphors from presented pairs (Malgady, 1977). However, no work has provided a conceptual construct for the kinds of metaphors children like, nor has it shown whether children value in a metaphor the same qualities as do adults.

The developmental literature on metaphorical production and comprehension offers several points which may bear upon children's metaphor preferences. When asked to produce metaphorical renamings for a variety of objects, children and adults alike employ shape and color as the most frequent grounds for their metaphors (Winner, McCarthy, Kleinman, and Gardner, 1979). Research on spontaneous metaphorical production by young children similarly indicates the primary grounds of early metaphors to be shape, color, and the child's enactive manipulation of the object (Winner et al, 1979). A decline in spontaneous metaphors during the grade school years has been documented (Billow, 1978; Snyder, 1979), which suggests that children may prefer literal rather than metaphorical language during this period.

The developmental trajectory of metaphor comprehension may also offer preliminary information concerning children's metaphor preferences. While even the preschooler understands simple, perceptual metaphors, it is not until late in grade school that the child comprehends certain more abstract metaphors, such as those likening personality traits to physical objects (Winner, Rosenstiel, and Gardner, 1976). This suggests that conceptual, nonperceptual metaphors might appeal to the child only after this age. It is also possible that such grounds would be appreciated slightly before they are comprehended fully, much as a child will laugh at a joke for a short time before he completely understands it (Zigler, Levine, and Gould, 1966, 1967).

A study was conducted in order to determine the role of ground in metaphorical appeal, and to document the evolution of preferences for different grounds. Subjects ranging in age from preschoolers to adults were asked to choose their favorite metaphors from several selections, in which different types of grounds were systematically varied.

In this study, there was no attempt to test an exhaustive taxonomy of grounds. Rather, grounds were selected as being representative of metaphors in speech and literature. In all, seven different kinds of completions were offered. Four perceptual object properties were represented: shape, color, sound, and movement. A nonperceptual, conceptual similarity formed the fifth kind of ground (e.g., similar affect). A combination ground, employing any two single grounds, was also included. Finally, a literal completion was offered.

The following hypotheses were proposed. It was predicted that younger children would prefer more "obvious" metaphors, while older subjects would prefer more "subtle" comparisons. As in other domains of development, ranging from person perception to classification of situations, children initially focus primarily on directly available perceptual and formal features. With age, they gradually move to an appreciation of more underlying, abstract, conceptual, or psychological elements. This trend should be reflected in metaphor preferences in several ways. Preferences should shift with age from static perceptual grounds to dynamic grounds to conceptual grounds. Combination grounds should become decreasingly popular with age, as increased "tension" (i.e., a greater proportion of dissimilarity) becomes desirable. Furthermore, younger subjects should favor a topic's particularly salient characteristics (as defined by independent judges) as the preferred ground of a metaphor. Placing an aesthetic value on "subtlety," older subjects should be less attracted to salient properties as metaphorical grounds.

Due to the decline in spontaneous metaphorical language in middle childhood, an affinity for literal completions over metaphors was hypothesized for these years. Younger children should select literal choices to some lesser extent, less strictly literal in their speech but still gravitating towards a "right answer." Older subjects, conscious of aesthetic values, should rarely choose literal completions.

Individual differences were expected in each age group. Some subjects should demonstrate a stronger than average attraction to the ground preferred by that age group as a whole, while other subjects, predicted to be a small

minority, would strongly prefer a ground relatively unpopular with their age-mates. On the whole, however, metaphor preferences should be more a function of age patterns than individual differences.

It was hypothesized that children would demonstrate an attraction to grounds which they are unable to explicate. Two sources would contribute to this outcome: first, if children have only a vague understanding of a ground, this should serve to heighten its challenge and interest; and second, explication is a conservative measure of comprehension, therefore increasing the possibility that preference would be demonstrated before explication.

Method

Subjects

One hundred and thirty-eight subjects (with approximately equal numbers of boys and girls at each age) participated in this study. Fifteen first graders, and six children in each of grades 3, 5, and 6, received an oral version of the test. Fifteen subjects in each of grades 3, 5, 6, 8, 10, 12, and college (sophomores and juniors) received a written version. The two versions were employed because of the necessity of giving an oral test to the youngest children. In order to ascertain whether the mode of presentation made a difference in the results found, both versions were administered to grades 3, 5, and 6, as indicated above.

In addition to these subjects, 15 preschoolers (mean age, 5:2) participated in an abbreviated, orally administered version of the study. Results from this group were analyzed separately.

Subjects were drawn from primarily middle-class backgrounds, and were selected at random from their classrooms. College subjects were randomly selected from an undergraduate psychology course, and their fields of concentration represented a cross-section of academic disciplines.

Materials

A Metaphor Preferences Test, consisting of 25 items, was constructed. Each item consisted of an incomplete sentence followed by five possible endings. Seven kinds of completions were systematically rotated throughout the test. Six of the completions yielded metaphorical comparisons, each based on a different ground: 1)shape, 2)color, 3)sound, 4)movement, 5)conceptual, 6)a combination of two grounds from 1 - 5. The seventh type of completion yielded a nonmetaphorical, literal sentence. Length and order of completions were controlled throughout the test. Table 1 presents two sample items, illustrating the seven types of completions.

Table 1
Sample Items for Metaphor Preferences Test

Falling autumn leaves are ...	/ground:
___glowing sunsets	/color
___shuffling feet	/sound
___pouring raindrops	/movement
___old photographs	/conceptual
___tossed confetti	/combination
The tire swing is ...	
___a windshield wiper	/movement
___a Cheerio	/shape
___a squeaky door	/sound
___an old wheel	/literal
___a favorite story	/conceptual

As part of the test construction phase, the ground of each metaphor was assessed by three judges. Four of the five completions for each item represented single metaphorical grounds (1 - 5, above), so that each single ground appeared as a completion on twenty test items. The fifth selection on each item consisted of either a literal completion (appearing on 12 items) or a combination ground (13 items). The two grounds combined within the combination ground were drawn from all of the five single grounds, and the two grounds appearing in a combination ground were always offered as single metaphorical grounds on that item.

Because of the memory and attentional demands of the task, preschoolers received an orally administered, abridged version of the test, consisting of ten items with three possible completions each. On the abridged test, shape and color grounds appeared on five items each, and the other five kinds of completions were each represented four times.

In order to investigate whether particularly salient properties of a topic guide the choice of a vehicle (and hence, guide preference for grounds), a measure of salient characteristics was obtained for the twenty-five topics. Ten adult judges were given a list of the topics which appeared on the Preferences Test. Judges were requested to indicate which two characteristics (e.g., shape, color, etc.) they would consider most salient, or primarily associated with, each item. When 80% or more of the judges agreed on the salient characteristic(s) of a topic, the item was marked as being salient for that particular ground(s). For example, color and movement were judged to be highly salient properties of "falling autumn leaves."

Procedure

Subjects were told that poems often involve "interesting and different names for things" and that the experimenters wanted to find out what kinds of poems people of different ages like best. In order to introduce the task, the experimenter then read aloud a sample incomplete sentence along with seven different completions, articulating for the subjects the ground of each comparison.

In both oral and written administrations of the task, the experimenter read each item aloud twice, as a series of five complete sentences. For each item, subjects were asked to select the completion they liked best and to state (or record) why they made their selection (i.e., to articulate the ground). The choices were then read again, and subjects were asked to choose their second favorite and again to explain the rationale. In the oral version, subjects were not allowed to say "the last one" or "the first one," nor to stop the experimenter while reading and say "that one," but were always asked to quote or paraphrase their selections. In the written version, subjects numbered their first and second choices on a multiple choice test sheet and recorded the reasons for their selections. In the oral version, children were seen individually for one session, or occasionally two, if there was evidence of fatigue during the initial session. Subjects given the written version were tested as a group in their classrooms.

During pilot testing, several anomalous choices (i.e., neither metaphorical nor literal completions of the sentence) were included on the test in order to ascertain whether children ever made their selections randomly or based solely on the appeal of the vehicle, regardless of its relation to the topic. Since no anomalous completions were selected during the course of extensive piloting, they were not included on the final test.

Scoring

Responses were scored in two ways. First, the number of times each type of completion was chosen as first and second choices was tabulated for each subject. Unless otherwise specified, all data analyses refer to these scores.

Second, because it was possible that a subject chose a completion with a different ground in mind than ours, responses were scored according to the ground articulated by the subject. For example, a subject might choose "Falling autumn leaves are old photographs," but give as a reason that "old photographs turn yellow like leaves." The subject would be given a color score for that response. Responses were scored by two judges, who achieved 94% agreement. Because of the high task demands of written responses for the younger children, only grade school children in the oral version were scored in this second way. After sixth grade, subjects' written responses were evaluated. In addition to the seven completion categories, two additional scoring categories proved necessary: 1)metonymic (associative) links between topic and vehicle (e.g., "Falling autumn leaves are old photographs" was preferred by a first grader, who explained that "you can take a picture of leaves"), and 2)inability to articulate a rationale (e.g., "I don't know" or merely repeating the topic and vehicle).

Results

Analyses Performed on Each Completion

A series of non-independent 2 x 8 (sex x age) analyses of variance were performed on the number of times each kind of completion was chosen as a first choice and as first and second choices summed.

Shape. Age proved a significant factor [$F(7, 137)=4.131$, $p<.001$] for the number of shape grounds chosen as a first choice. First and fifth graders selected shape metaphors significantly more often than sixth, tenth, twelfth, and college students (Newman-Keuls, $p<.05$). Third and eighth graders chose shape metaphors at a level intermediate between these two groups. On the summed choices, there was no significant effect of age. There was no effect of sex.

Color. A significant effect of age [$F(7, 137)=6.810$, $p<.001$] was found for the number of color grounds chosen as a first choice. A similar effect was evident on the summed choices [$F(7, 137)=9.054$, $p<.001$]. Younger children (grades 1 - 6) chose color grounds significantly more often than all older subjects (Newman-Keuls, $p<.05$). There was no effect of sex.

Sound. Age proved significant [$F(7, 137)=4.871$, $p<.001$] for sound grounds chosen as a first choice. Sixth and eighth graders chose significantly more sound completions than first, third, and fifth graders, while those above eighth grade chose sound metaphors at an intermediate level of frequency (Newman-Keuls, $p<.05$). Age also proved significant on the summed choices [$F(7, 137)=3.994$, $p<.001$]. Newman-Keuls analyses revealed that sixth and eighth graders chose sound metaphors more than all other subjects ($p<.05$).

A significant effect of sex was also found on the number of sound completions chosen as a first choice [$F(1, 137)=7.184$, $p<.01$] and on summed choices [$F(1, 137)=10.499$, $p<.005$]. Females chose significantly more sound completions than males. An interaction of sex and age was found on first choice selections [$F(7, 137)=2.929$, $p<.01$], with males choosing more sound metaphors than females in grades 1, 6, and 8, and females choosing more than males on this dimension in grades 3, 5, 10, 12, and college.

Movement. On first choices, no significant effect of age was found in selection of movement metaphors. On summed choices, age proved significant [$F(7, 137)=3.638$, $p<.002$]. Newman-Keuls analyses ($p<.05$) indicated that first graders chose significantly fewer movement metaphors than older subjects. Sex was not significant.

Conceptual. The effect of age on selection of conceptual grounds was significant for both first choices [$F(7, 137)=13.361$, $p<.001$] and summed choices [$F(7, 137)=12.497$, $p<.001$]. Subjects in grades 1 - 8 selected conceptual completions significantly less frequently than all older subjects (Newman-Keuls, $p<.05$). There was no effect of sex.

Combination. The effect of age proved nonsignificant for combination grounds. While there was no significant effect of sex on first choices, sex proved significant on the summed choices [$F(1, 137)=6.566$, $p<.02$), with females choosing combination grounds significantly more often than males.

Literal. Age proved significant on literal completions selected on the first choice [$F(7, 137)=5.198$, $p<.001$]. Newman-Keuls analyses indicated that first and third graders chose literal completions significantly more often than subjects in grades 5, 6, 12, and college ($p<.05$). Eighth and tenth

graders selected literal completions at an intermediate level of frequency. On summed choices, age was a significant factor [$F(7, 137)=7.237$, $p<.001$]. First and third graders chose literal completions significantly more often than all older subjects (Newman-Keuls, p .05). There was no effect of sex.

Relative Ground Preferences

The analyses of variance discussed above reveal the development of preferences for each kind of completion. In order to determine the hierarchy of preferences for the different completions within each age, the average number of times a completion was chosen at each age was divided by the number of times that the completion appeared on the Metaphor Preferences Test. This yielded a set of seven comparable percentage scores at each age. Figure 1 charts the preferences for each completion on summed choices.

A hierarchy of preferences for the different kinds of completions was evident at each age. In order to discuss this hierarchy, grounds separated by less than five percentage points have been grouped. Summed choices are discussed here, since they reveal the more complete pattern of preferences than first choices alone.

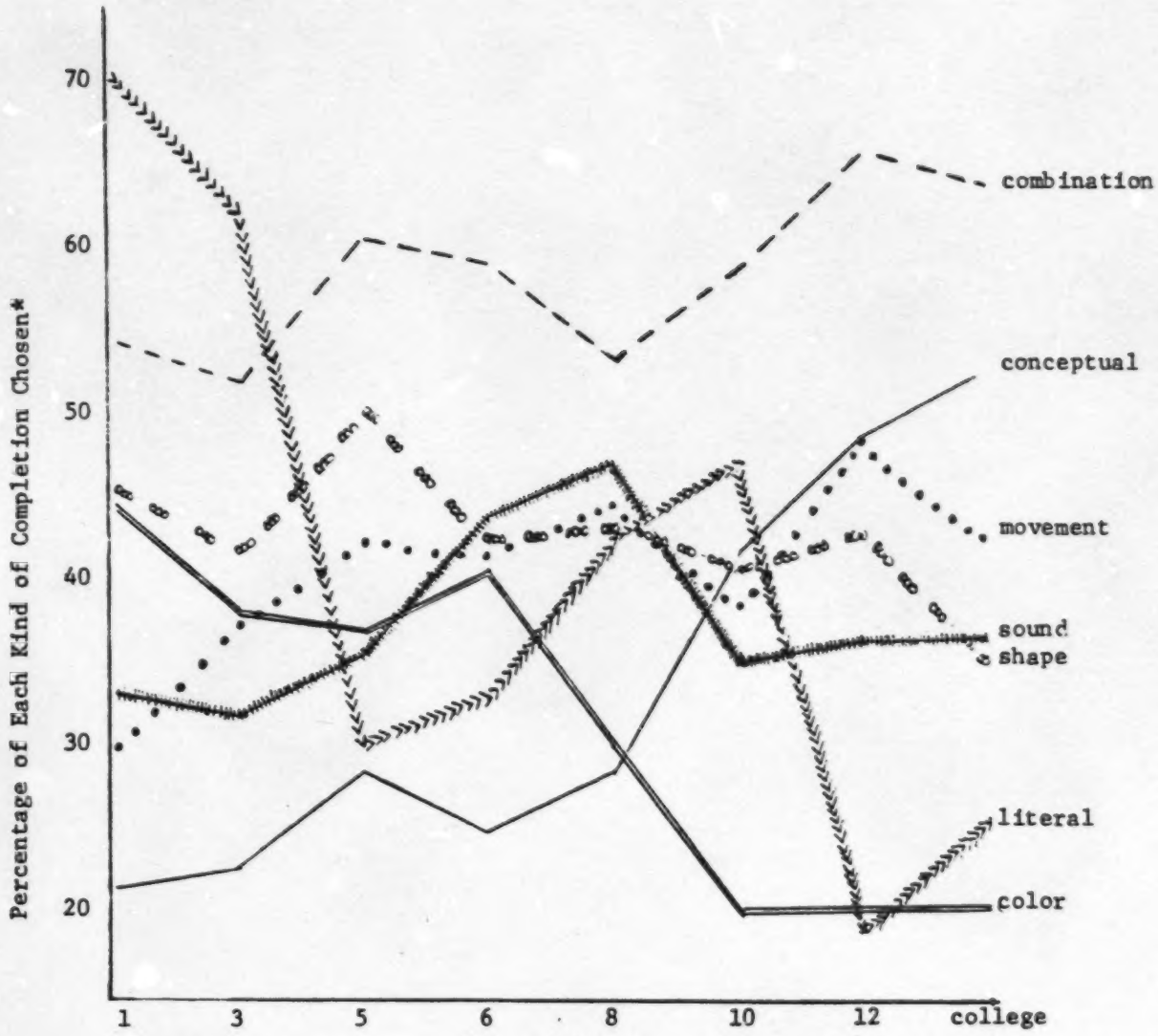
In first and third grade, literal completions were clear favorites, followed by combination metaphors. The completions preferred by first graders were as follows: 1)literal, 2)combination, 3)shape and color, 4)sound and movement, and 5)conceptual. The order of third grade preferences was 1)literal, 2)combination, 3)shape, color, and movement, 4)sound, and 5)conceptual. In fifth grade, 1)combination metaphors were most popular, followed by 2)shape, 3)movement, 4)color and sound, and 5)literal and conceptual.

While in the three youngest grades, grounds were differentially preferred and yielded a clear hierarchy, in the sixth grade, the grounds were less differentiated in their appeal. The sixth graders preferred, in decreasing order of preference: 1)combination, 2)a cluster of sound, shape, movement, and color, 3)literal, and 4)conceptual. The cluster effect remained evident in the eighth and tenth grades as well, but with a shift in the grounds preferred equally. In the eighth grade, 1)combination metaphors were followed by 2)a cluster of sound, movement, shape, and literal, and 3)color and conceptual. In tenth grade, 1)combination preceded 2)literal, 3)conceptual, movement,shape, and sound, and 4)color.

The hourglass-like configuration (see Figure 1) of the single metaphorical grounds again spreads out in twelfth grade and college. High school seniors revealed a preference hierarchy for 1)combination, 2)conceptual and movement, 3)shape, 4)sound, and 5)color and literal. College students ranked the completions as 1)combination, 2)conceptual, 3)movement, 4)sound and shape, 5)literal and color.

A comparison of the profiles of grounds at either end of the spectrum--first graders and college students--offers an instructive contrast. With the exception of the continuous appeal of combination metaphors, the completions of choice shifted almost completely, with the first grader's attraction to literal, shape, and color selections replaced by the college student's preferences for conceptual and movement grounds.

Figure 1
Percentage of Completions at Each Age on Summed Choices



*Note: The percentages were computed as follows. The average number of times a completion was chosen at each age was divided by the number of times that the completion appeared on the Test. This yielded a set of seven comparable percentage scores at each age.

KEY
shape
color
sound
movement
conceptual
combination
literal

Preschool Results

A profile of the grounds selected by preschoolers on the abridged test revealed a pattern similar to first graders in many respects. Literal completions and combination grounds ranked first and second respectively; conceptual metaphors occupied the lowest position. Similarly, shape held a position of high appeal to both preschoolers and first graders, and movement was relatively unattractive. However, the proclivity towards color-based metaphors evident in the early grade school years was not apparent among preschoolers, who ranked color near the bottom of their hierarchy.

Individual Differences

To ascertain whether there were individual differences in metaphor preferences, subjects were assigned to a completion category if they selected at least 60% of the completions on the test which employed that kind of completion. For example, a subject who chose 15 color grounds (out of the total 20 items which offered color completions) was designated a "color" subject. If a subject met the 60% criterion for more than one ground, he was assigned to two (or in rare instances, three) completion categories. Table 2 presents the percentage of subjects at each age who met the criterion for each completion.

At all ages, the largest percentage of subjects assigned to a completion category occupied the combination category: 52% of subjects from first grade through college selected at least 60% of the combination metaphors. Children with a strong propensity for the literal completion comprised 58% of the first and third graders; 19% of the fifth and sixth graders; 33% of the eighth and tenth graders; 7% of the twelfth graders and college students.

The number of subjects who were categorized into one of the single metaphorical grounds ranged from 27% to 50% of the subjects at each age. In the first and third grades, 17% of all subjects demonstrated a strong preference for color, and 8% were shape oriented. While color preference appeared in only 5% of the fifth and sixth graders, 31% met the categorization criterion for selection of shape metaphors. In addition, 7% showed a proclivity for sound grounds and 10% for movement metaphors. From eighth grade through college, no subject displayed a strong color preference and 3% of all older subjects chose the criterion level of shape metaphors. In grades eight and ten, 13% of the subjects demonstrated a sound preference and 10% indicated attraction to movement metaphors. A strong attraction to conceptual metaphors was seen for the first time developmentally in 20% of the tenth graders. In twelfth grade and college, no subjects chose sound metaphors often. Of these older individuals, 10% found movement an appealing ground, and 20% demonstrated a strong preference for conceptual metaphors.

In sum, a portion of each age group demonstrated a strong preference for one (or more) grounds. These exceptionally favored grounds tended to be the grounds appreciated, but to a lesser extent, by the other subjects at each age. Hence, the youngest subjects who demonstrated strong preferences selected shape and color grounds; older individuals chose a high proportion of sound and movement metaphors; and some individuals in high school and college strongly preferred conceptual grounds. The one major exception to this was the proclivity of a third of the eighth and tenth graders for literal completions. On the whole, metaphor preferences differed more widely between rather than within ages.

Table 2

Individual Differences

Percentage of subjects choosing at least 60% of the completions

Grade	Completion						
	Shape	Color	Sound	Movement	Conceptual	Combination	Literal
1	7	20	--	--	--	40	67
3	10	14	--	--	--	38	52
5	33	5	5	10	--	43	24
6	19	5	10	10	--	67	14
8	7	--	20	13	--	34	27
10	--	--	7	7	20	60	40
12	7	--	--	13	13	67	7
College	--	--	--	7	27	73	7

Oral vs. Written Administration of the Test

In order to insure comparability of the oral and written versions, children in grades 3, 5, and 6 who were tested orally were compared with children of the same age who received the test in written form. No significant differences occurred on the summed choices as a result of the mode of presentation; on first choices alone, a significant difference was found only on the number of sound metaphors chosen in the two versions [$F(1, 62) = 4.595$, $p < .05$]. Children given the test in written form chose sound metaphors as a first choice more often than subjects receiving the oral version. It is possible that this effect is due to the difficulty posed by remembering a metaphor based on sound, which is difficult to visualize. Such memory demands would not be encountered in the written administration of the test, and they would be lessened in the oral version by an additional reading for the second choice selection. It is also possible that the oral presentation interfered with forming an auditory image.

Saliency

The number of selections which corresponded to the grounds deemed as salient by the adult judges was tallied for each subject on summed choices. Of the total 29 times on which a salient selection was possible, age means from first grade through college oscillated between 12 to 15 salient selections. A significant effect of age was found [$F(7, 137) = 4.135$, $p < .001$]. Newman-Keuls analyses revealed that first and third graders chose significantly fewer salient grounds than fifth and sixth graders, with older subjects at an intermediate level ($p < .05$).

Explication of Grounds

As discussed above, subjects received two sets of scores, one for the completion chosen and another for the ground offered as explication. The grounds articulated by subjects in grades 1 - 6 in the oral administration of the test were compared to the grounds assigned to the metaphors by the adult judges. A steady improvement in agreement between the two sets of scores appeared from first through sixth grade, increasing from 62% to 74% agreement. The increased concurrence resulted from several factors: a decrease in the number of times a subject could offer no explication; an increased ability to articulate both grounds of a combination metaphor; and fewer associative, nonmetaphorical links between the two terms.

In addition to the evaluations of oral explications given by the younger subjects, written explications of the older subjects above sixth grade were evaluated. Different grounds proved challenging at different points in development. Even the youngest children encountered little difficulty explicating perceptual grounds, likening, for example, a "popped red balloon" to a "bottle of ketchup" on the basis of a common color. The perceptual metaphors were the most popluar in the early grades--and two-thirds of the first and third graders chose the "ketchup" comparison. An equally high percentage of subjects in twelfth grade and college chose to compare a "popped red balloon" with a "washed-away sandcastle," articulating the conceptual link as "both have been destroyed" and "the prime has past, with only remains left." At all ages, some conceptual metaphors were selected—but first and third graders articulated the conceptual ground on only 20% of the conceptual metaphors which they selected. The first grader's attempt to forge the connection

between the popped red balloon and the washed-away sandcastle consisted of "Cause the popped red balloon is like red things in the water, like maybe crabs" and "When you have a sandcastle and then have to go home, it gets soggy--and the same things happens with a balloon,'cause it gets spitty." However, fifth, sixth, and eighth graders offered correct explications for two-thirds of their conceptual metaphor selections.

Literal selections were most frequently explained from the youngest child to the adult with "Cause that's what it really is." In addition, children in the older elementary school grades tended to express a concern with the purpose of a statement, frequently stating, "That one tells the most information" or a similar remark. Many eighth and tenth graders who chose literal completions demonstrated an explicit awareness of "defying" metaphor, as one junior high school student wrote, "I always like to say things right out." The growth away from literalism was marked by similar evidence of "self-awareness." Beginning with fifth graders, subjects frequently rejected literal answers by commenting, "That's too normal." By high school, subjects remarked on the relative "poeticness" or "vivid imagery" of a metaphor.

Item Effects

In order to determine whether or not subjects across ages preferred the same completions on some items, contingency tables (grade x ground) were set up for each item. On one third of the items, the same completion was chosen as a first or second choice by at least 66% of the subject population. The grounds underlying those eight popular selections were: combination (three items), shape (two items), sound (two items), and movement (one item). On the remaining two-thirds of the Test items, no single metaphor appealed to subjects at all ages, indicating that preference consistency was higher within age groups than across ages. Therefore, on the majority of items, no one metaphor was a compelling choice to subjects across ages.

Discussion

The results demonstrate that the ground of a metaphor has a significant effect on its appeal. Furthermore, different grounds appeal at different ages, indicating that children's ideals in metaphor differ from the aesthetic qualities valued by adults. The hypothesized development of preferences from more "obvious" metaphors to more "subtle" comparisons is evident in the shift from static perceptual grounds (shape and color) to dynamic grounds (sound and movement) to conceptual grounds.

The first metaphorical grounds which grade school children find appealing are the static perceptual properties of shape and color, grounds which also constitute the earliest metaphors that children themselves produce (Winner et al, 1979). When children are given sorting tasks pitting color versus form, the initial sorting criterion used by the child is color, with shape emerging as a later taxonomic concept (Bruner, Olver, and Greenfield, 1966). Concurrent with this well-established finding that color gives way to shape as a basis for classification, color decreased markedly in appeal as a met-

aphorical ground after grade school, while adults continued to judge shape as an adequate, although not outstanding, ground. Of these two static perceptual qualities, shape appears to be an important and interesting enough feature of objects to maintain some appeal as a basis for metaphorical comparison. Color, on the other hand, may be too obvious or superficial a characteristic to satisfy adult standards.

With age, an appreciation develops for dynamic grounds, with movement and sound increasing in popularity. This development seems to reflect a shift away from strictly visual, static, relatively constant features of an object, towards more abstract and also transient properties.

Finally, as hypothesized, the metaphor of choice at the adult end of the developmental spectrum is based upon the conceptual ground, which highlights abstract, nonperceptual qualities of the terms. However, the increased appeal of the conceptual metaphor occurred surprisingly late in the sequence of development: Not until tenth grade was the conceptual metaphor preferred. A logical place to turn for elucidation of this late emerging appreciation would be the child's comprehension of conceptual metaphors. But a deficit in comprehension of conceptual grounds is apparent in the early grade school years only. While first and third graders appropriately explicated only a fraction of the conceptual metaphors which they selected, by fifth grade, children proved fully capable of articulating the ground of the majority of their conceptual selections. Similarly, previous research indicates that comprehension of nonperceptual metaphors develops by the late grade school years (Winner, Rosenstiel, and Gardner, 1976; Gardner, Winner, Bechoffer, and Wolf, 1978).

A similar decalage between comprehension and appreciation may be indicated by the relatively few color metaphors chosen by preschoolers in contrast to early grade school children, although the preschoolers proved capable of explicating their color selections. Furthermore, while the younger subjects aptly articulated the grounds of sound and movement metaphors, preferences for these completions did not emerge until later. Unlike jokes, which children appreciate before fully understanding (Zigler, Levine, and Gould, 1966, 1967) or upon recent attainment of understanding (McGhee, 1973), aesthetic appreciation of metaphors neither anticipates nor coincides with comprehension, not even the high level of comprehension demanded by an explication task. Instead, comprehension appears to be a necessary but not sufficient precursor to aesthetic preference.

Reflecting the shift from "obvious" to "subtle" metaphors, it was hypothesized that combination grounds would decrease in popularity with age. Instead, the strong attraction to combination metaphors was singularly marked by its constancy, with a high preference persisting throughout development from preschoolers to adults. The appeal of multiply grounded metaphors was especially notable as it was maintained across all combinations of grounds. Rather than seeing the combination ground as containing too much similarity and too little "tension," adults and children alike valued the richness of the dual shared properties, preferring the combination metaphors by a wide margin over any single ground at every age.

It was also expected that, with an increasing appreciation for "subtlety," the tendency to favor salient characteristics as grounds would decline. No

such decline was evident, but rather there was an increase in the fifth and sixth grades in selection of salient grounds. In general, it appears that developing aesthetic sensitivity inheres not in a decreasing (or increasing) proclivity for salient properties of particular topics (e.g., color of snowflakes), but in the changing attraction to the grounds per se (e.g., decreased preference for color, independent of its saliency for snowflakes). The increased appeal of saliency in the late grade school years may reflect some aspect of the "literal" concerns often attributed to this period (Gardner, 1973). Children of this age often expressed an interest in "conveying the most information" through their selections on the Preferences Test, perhaps paralleling their development as nonegocentric communicators (Piaget, 1955; Krauss and Glucksberg, 1969). A topic's salient trait may be seen as its most relevant property and hence, perhaps, that information which should be highlighted in a metaphor.

However, contrary to hypothesis, there was no increase during grade school in the proclivity for literal completions. Young subjects preferred literal over metaphorical completions, confirming previous research findings (Gardner, 1974). While research suggests that grade school children demonstrate increasing "literalism" in their spontaneous speech (Billow, 1978; Snyder, 1979), they demonstrated a decreased attraction to literal completions on the Preferences Test. The decline in literal selections suggest that aesthetic development continues steadily during the years of middle childhood, with an increased sensitivity to figurative language. Furthermore, the older grade schoolers demonstrated a deeper understanding of the request to select "poetic" ways of saying things. When encouraged by the "rules of the game" to be metaphorical rather than literal, children showed their capacity to appreciate figurative language, much as they prove fully capable of producing metaphors when requested to do so in an experimental setting (Winner et al, 1979). Any decline in metaphorical ability during grade school appears to be a deficit in performance, not in competence.

A surge in literal selections did occur, but at the unexpected age of eighth and tenth grade. A third of the subjects in grades 8 and 10 demonstrated a strong preference for the literal (i.e., selecting at least 60% of literal completions offered). Unlike the youngest, strongly literal children, the eighth and tenth graders demonstrated a striking and explicit awareness of what they were rejecting, often articulating a defiance of the nonliteral and announcing a preference for unadorned modes of expression. The literal preferences distinguishing these subjects from the remaining two-thirds of their classmates, who displayed no rise in literalism, seemed almost a statement of self-presentation and personal identity, as one tenth grader wrote, "I like to be more exact about things and more direct." If such a preference is part of the young adolescent's identity, it is a seemingly transient one—for by the twelfth grade and college, "literalism" has again diminished.

In no other category or age of the Individual Differences categorizations was there a difference of kind of ground (as compared with peers) rather than degree in the ground heavily favored. While the third of eighth and tenth graders choosing literal selections differed sharply from their classmates, the other Individual Difference trends merely reflected a particularly heightened attraction of certain individual subjects to the same grounds which their peers favored. With age, the tendency for Individual Differences categorizations

shifted from color and shape to sound an movement and to conceptual grounds, paralleling the development of preferences as a whole.

Finally, a note about the nature of the task deserves mention here. Explication of the ground of a metaphor has been demonstrated to be a stringent and demanding measure of comprehension, more difficult even than supplying an omitted topic (Winner, Engel, and Gardner, in press). Because of the metalinguistic demands of the task, it can be expected that comprehension exists earlier than revealed by an explication measure. Evidence that subjects of all ages were responding consistently and appropriately to the multiple choice task can be drawn from three sources. First, even given the linguistic demands of explication, the majority of the explications at all ages were apt, providing support that subjects were primarily perceiving metaphors to have the same grounds that adult judges had attributed to them. Second, for those grounds which subjects of a certain age could not correctly explain, preferences were low, yielding a strong correlation between comprehension deficit and low attraction. Third, in this study, even the youngest children demonstrated consistent preferences for particular kinds of metaphors. While the preferred grounds of the younger subjects were different than those of the older subjects, they were no more random. Such a finding differs from previous research, in which children's selections of preferred similes were shown to become increasingly consistent with age (Malgady, 1977).

This investigation provides evidence that the judged quality of a metaphor is strongly related to its ground. Furthermore, it documents the development of preferences for different grounds, revealing the shifting preference hierarchy at different ages. More finely grained distinctions within the broad taxonomy of grounds employed here can help to further elucidate the factors contributing to metaphor appreciation.

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Harvard Project Zero is a basic research program at the Harvard Graduate School of Education. Its original charge was to study creation and comprehension in the arts and means toward better art education. A prime objective throughout the Project's history has been to provide a sound theoretical and experimental base for effective education of artists and audiences. The Project began in the fall of 1967 in response to the frank admission that, however much is known about how to educate in science and how to evaluate scientific work, practically nothing is known about the underlying principles of how to teach and evaluate in art. From that challenging "zero" the Project took its name and tasks. Our research methods include rigorous conceptual analysis, investigation of relevant literature, design and execution of key experiments in psychology and other fields, visits to arts education institutions, and application of results to proposing and assessing programs in art education.

Project founder and former director Nelson Goodman's book Languages of Art (Bobbs-Merrill, 1968) has provided important direction in our effort to isolate and investigate basic skills. This work sets forth a "theory of symbols," a broad treatment of elements of communication, embracing words, gestures, diagrams, paintings, poems, musical scores, and so on. Almost all the psychological processes under consideration in our studies of the arts involve extensive operation with and upon symbols of various kinds. These symbols are not merely instruments of communication, but also instruments of cognition, tools in terms of which the mind deals with the perceptual world.

Some of our research has examined the psychological implications of the theoretical models of symbol systems introduced in Languages of Art. For instance, one question is whether different information processing skills are necessary to produce effective art within linguistic, versus nonlinguistic, symbol systems. Another, complementary approach emphasizes problem solving and search strategies in the moment-to-moment perception and production of a work of art. How do subjects search for rhyme words in poetry or explore alternative placements of pieces in collage? A favorite means of developing and testing new models is through the study of errors. By using impoverished or ambiguous stimuli, assigning tasks somewhat too difficult for a subject, or working with brain-damaged subjects, one can elicit patterns of error-making which suggest hypotheses and select between alternative models of a process. These approaches characterize many of the Project's investigations mentioned below in a list of Project members and their particular interests.

Though the development of actual curricula in arts education is not a primary concern, the Project does contribute to the field of practical education. Project members have responded to inquiries and requests to comment on curricula from teachers in the field. Establishment of Harvard Summer School's Institute in Arts Administration resulted from the Project's reply to an inquiry from the director of the Harvard Summer School, and members of the Project staff cooperated in planning the Institute, in preparing material, and in the actual teaching. Consideration consultation has been provided to schools, museums, television, and a variety of arts institutions by members of the Project.

The Project has also sponsored a series of lecture-performances in various media, designed to give the general public and prospective public school teachers and administrators better insight into and attitudes towards artists and the arts. As the series title "Art in the Making" suggests, the purpose of the lecture-demonstrations was to reveal something of the artist's way of working, rather than to display his products. In the presence of an audience free to ask questions, each artist explored alternatives, exposed some constraints of his medium, compared his various efforts, and searched for the right effect, choice by choice.

While maintaining a major concern with the arts and art education, the Project, under its current co-directors, has considerably broadened its field of inquiry and now investigates a whole range of topics in the area of cognitive psychology. One part of the Project has focussed particularly on developmental studies. Among the topics currently being investigated are the emergence of symbolic capacities during the first years of life; the development of literary abilities, specifically the capacity to produce and appreciate metaphors and stories; children's understandings of the various worlds presented on television; the emergence of drawing skills; and the breakdown of various symbol using capacities under various forms of brain damage. The other part of the Project has concentrated on studies in the areas of cognitive and perceptual psychology, ones which utilize both normal adult subjects and gifted artists. Among the topics investigated recently have been critical judgment and the sources of critical disagreement in adults; the thought processes of professional and amateur poets and painters in developing works; the role of geometric principles in visual perception and picture perception particularly; reasoning about everyday matters and the logical difficulties people encounter.

A list of recent papers which can be purchased from the Project is available upon request.